great developments to be recorded. We think that the inclusion of such subjects as photography (fifty-five pages) has helped to swell the volume to unnecessarily large proportions. The technics of a special branch such as this seems scarcely at home in its surroundings. We welcome in particular the articles of Drude on the nature of light, on the theory of light for transparent media at rest, for absorbing media, and, finally, for media in motion.

The book is replete with references to original papers, and may be taken as being as complete a handbook for the professional reader as has yet appeared.

GARDEN-BOTANY.

Hortus Veitchii, a History of the Rise and Progress of the Nurseries of Messrs. James Veitch and Sons, together with an Account of the Botanical Collectors and Hybridists employed by them and a List of the more Remarkable of their Introductions. By James H. Veitch. Pp. 542; illustrated with fifty photogravure plates. (Chelsea: James Veitch and Sons, Ltd., 1906, for private circulation.)

THIS is one of the most sumptuous volumes which have ever emanated from a business house, but if it were simply a business publication it would claim no special notice in these columns. It is, in fact, a most important contribution to the history of horticulture during three-quarters of a century or more, and a valuable work of reference for the systematic botanist and the hybridist. It illustrates in a remarkable degree the service which the enterprise of a great commercial firm is capable of rendering, and in this case has rendered, to botanical science. As the author appropriately says:—

"To the representatives seeking unknown plants at one period or another in almost every clime, fortune has not invariably been kind, but the work of such men as Thomas Lobb, William Lobb, the late John Gould Veitch, Charles Maries, and E. H. Wilson has been a gain in every way; whilst the efforts in hybridising and selecting of John Dominy, John Seden, V.M.H., and John Heal, V.M.H., have given a wider interest to all cultivators."

With the history of the firm and its various members as given in the introduction to the present volume we are not here concerned, but we may indicate that it would furnish valuable data for Mr. Galton's science of eugenics. The biographical sketches of the twenty-two travellers employed by the firm are so interesting that we could have wished them longer. Whilst very many of the plants introduced into cultivation by the energy and zeal of these men have proved of first-rate importance from a gardener's point of view, as shown, amongst other things, by the fact that no fewer than 422 plates representing Veitchian introductions have been published in the *Botanical Magazine* under the editorship of the two Hookers and their successor, Sir William Thiselton-Dyer, thousands of herbarium specimens have been generously presented to the national botanical establishments and to individual botanists engaged in the study of particular groups.

When we come to the section relating to the hybridists who have achieved success in Messrs. Veitch's nursery we are again disposed to regret that fuller details were not given, but in view of the magnitude of the book and the immensity of the task we are by no means surprised that the author has felt it necessary to give indications only. Certain it is that the students of hybridisation, variation, and heredity will find inexhaustible materials for study in the results obtained by Messrs. Veitch. It is a noteworthy fact that at the present time, when orchids are so popular, greater interest is felt in the hybrid "creations," in the production of which John Dominy was the pioneer, than in new introductions. When we read of a thousand pounds and more being paid for one of these specimens we can but regret that orchid lovers do not contribute more to encourage scientific research into the history and nature of the plants in which they take such keen interest. The list of species of orchids introduced by Messrs. Veitch occupies no fewer than forty-seven pages. A large proportion of these were described by Lindley, by Reichenbach, and subsequently by Rolfe, and short descriptions and historical notes are afforded in these pages. Orchid hybrids are treated in like manner, the particulars relating to them filling fifty-seven pages, exclusive of an appendix giving historical details, and occupying six pages of small type. The information here given will be of special value to those engaged in the study of hybridisation.

Space will not allow us to do more than mention the sections relating to stove and greenhouse plants, to which eighty-three pages are devoted, to the various species and hybrids of Nepenthes, the ferns, the coniferous trees, the deciduous and evergreen trees and shrubs, the herbaceous plants, the bulbous plants, the Amaryllis, the Begonias, the greenhouse Rhododendrons, the Streptocarpus, and, lastly, the fruits and vegetables, all exclusively the result of the enterprise or of the skill of Messrs. Veitch and of their assistants. With such a vast amount of material it is evident that severe compression has had to be effected, but even so the record is a marvellous one. Happily an excellent index is provided.

Throughout it is obvious that great pains have been taken in the preparation of the volume, the solid worth of which is enhanced by the excellent manner in which it has been produced.

OUR BOOK SHELF.

Avogadro and Dalton. The Standing in Chemistry of their Hypotheses. By Dr. Andrew N. Meldrum. Pp. 113. (Edinburgh: W. F. Clay, 1904.) Price 3*s.* net.

THIS book may be read with interest by all chemists, and with special profit by students who have got into confusion with the difficult piece of chemical history of which it treats.

Dr. Meldrum sets himself to define the true relationship and standing of the hypotheses of Dalton and Avogadro. Prof. Japp, in his preface, states that he has nowhere else seen the true ratiocinative order of precedence of the molecular and atomic hypotheses

"expounded with such wealth of illustration and with so exhaustive a knowledge of the fundamental literature of the subject." This praise is, we think, fully deserved. Dr. Meldrum brings stern logic to bear on the question, and approaches his task with a grim earnestness which imparts an unintentional tinge of humour to his book. He is no respecter of persons, and he handles with some severity all those who, in his opinion, have been unfaithful to the facts. "The atom," says Dr. Meldrum, "in the modern theory of chemistry is a 'dependency of the molecule.'" "Avogadro's hypothesis being the fundamental hypothesis of chemistry, other doctrines concerning molecules and atoms are to be subordinated to it." "The atom can be defined with reference to the molecule; it is doubtful if any other definition is sufficient." These quotations will perhaps suffice to indicate Dr. Meldrum's view. Dalton's hypothesis came first, but since 1858, when Cannizzaro appeared on the scene, Avogadro's hypothesis has been the fundamental one. We do not think that this can be seriously contested, taking the words strictly in the sense intended by Dr. Meldrum. At the same time there is surely some danger of a too pedantic insistence on this question of "ratiocinative precedence." If we look upon the progress of chemistry, and not merely on its present state, it is hardly a crime to speak of that hypothesis as fundamental which has been the immediate cause of another that has ultimately proved more general, comprehensive, and fruitful, and whilst no doubt there has been some laxity on the part of chemical writers in their choice of words, the great fact that Dalton came first, and that without Dalton there is no reason to suppose there would have been an Avogadro's hypothesis, will still be regarded, we suspect, as a justification for some of the statements which Dr. Meldrum criticises so severely.

In saying this we do not wish for a moment to underestimate the service which Dr. Meldrum has rendered by giving us this very searching and able review of the bases of modern chemical theory.

A. S.

Die radioaktiven Substanzen und die Theorie des Atomzerfalles. By Prof. Paul Gruner. Pp. 103. (Bern: A. Francke, 1906.) Price 1.60 marks.

THIS little book of 100 pages, we learn from the preface, had its origin in courses of lectures delivered by the author at the University of Berne during the session 1904–5, and is designed to give a complete yet short review of the whole field covered by the title, including the most recent investigations. The subject is presented from the point of view of the disintegration theory, and the phenomena connected with the induced activity are treated at length. The physiological action of radio-active substances, and their existence in springs, &c., are not considered except in passing.

The author is to be congratulated on having fully carried out his intention, and has succeeded in producing a very readable account of the subject from the physical standpoint, which is thoroughly up to date; but the value of the work would have been much enhanced by more diagrams. Only three are included, illustrating the decay and growth curves of the induced activity of radium, and not a single diagram of any experimental piece of apparatus is shown. Practically nothing is said of the methods of measurement in use in the laboratory, although perhaps this is as well in a subject of this kind, where a little knowledge is apt to be a dangerous thing. On the other hand, the author has contrived to compress within the one hundred pages of his book a surprising amount of the best of the most recent literature, and this makes us venture to express the hope that in a future edition the author will rely less on the existing compilations in dealing with the earlier researches, and will extend to the whole literature of the subject the same careful and first-hand consideration he has shown in dealing with the latest researches.

Of criticism or comment there is little or none, but there is evidence of considerable skill in the selection of the material whereby the most important researches secure prominent treatment. With the exception of the recent work emanating from Australia on the α rays, of which perhaps the full bearing has not been sufficiently brought out, the living branches of the subject have been done full justice to. A reference to the parts dealing with the slow transformation products of radium, radio-thorium, the origin and ultimate product of radium, the work in Germany and France on the production of helium from radium and actinium, and radio-tellurium and polonium, shows that the author has included the best of the current work on the most important problems.

F. S.

Introduction to Astronomy. By Prof. Forest Ray Moulton. Pp. xviii+557. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1906.) Price 5*s.* net.

STUDENTS of astronomy will find in Prof. Moulton's volume an excellent text-book which, by its lucidity and wealth of detail, will enable them to obtain a fairly thorough grasp of their subject.

After two chapters dealing with general outlines and definitions we find a very useful chapter on the constellations, with special paragraphs on the more important stellar groups and simple methods of locating them. Four clearly printed maps, so bound that they open out flat when the book is opened, will be found very useful in the practical work which here and throughout the book is insisted upon as being essential.

Telescopes, their evolution and various types, are then discussed, whilst the earth, its movements, gravitation, and time are dealt with at some length in the four succeeding chapters.

Chapters ix. to xii. deal with the moon, eclipses, the solar system as a whole and its individual members, respectively. The chapter on comets and meteors which follows leaves little, if anything at all, to be said concerning the general phenomena and the historical apparitions of these bodies.

Probably in no branch of astronomy have such rapid advances been made during recent years as in solar physics, and of the results obtained therefrom Prof. Moulton takes the fullest advantage in the forty-nine pages of description and discussion which he devotes to the sun in chapter xiv. Again, as a pioneer worker on the probable evolution of the solar system, he is seen to great advantage in the next chapter, where he describes and criticises the Laplacian hypothesis, explains the work of Sir George Darwin, and summarises the theories advanced by Prof. Chamberlin and himself.

In the concluding chapter we have an epitome of our present knowledge concerning "the stars and nebulas," in which the facts and observations of most branches of sidereal astronomy are clearly stated and discussed.

The numerous questions placed at the end of each chapter and the excellent and up-to-date illustrations add greatly to the value and interest of the volume as a text-book.

W. E. R.